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THE INDUSTRY'S TECHNICAL MEN

THE Gas Industry, we have been told, is eventually to be taken over "lock, stock, and barrel" into some form of public ownership. The Government has still to tell us just what that form is to be. In the meantime we have something like two years, in all probability, in which to speculate on what some of the effects of public ownership will be on the several aspects of our lives in the Industry. What will be its effects, for instance, on the status of the technicians in the Industry, those who form the membership of the Institution and its affiliated District Associations, senior and junior ?

In two respects we are fortunately placed. The Education Scheme is in full working order and the qualifications of the Chartered Gas Engineer are clearly defined. There is no longer any excuse for the employment of unqualified persons in the operation and direction of the Industry. Scales of remuneration have been suggested, though these scales need both revision and clarification. They need revision because, at any rate those regulating the salaries of engineers and assistant or deputy engineers, were based on 1938 values. They need clarification because they left a number of loose ends. For instance they do not clearly distinguish between engineer and engineer-and-manager and they do not take account of perquisites, such as house, coal, gas, car allowance, &c. But the scales do set a standard upon which a satisfactory system of remuneration can be built up. Whether the basis of this standard is sound or whether it will continue to be sound under the new dispensation, may be open to question. The existing scale is based upon the size of the undertaking judged by the sales of gas. It may be that extensive integrations and regionalization will render such a basis irrelevant. If so the suggestion already made, that technical personnel should be graded according to qualifications, experience, and achievements, merits re-examination.

Public ownership should free the technical man from some irritants and disabilities. Whether these are replaced by others depends to a considerable extent on the thinking and organization which is put in during this interim period. The Government has announced, through the responsible Minister, that it wishes the Industry to be managed by its own technicians and not by civil servants. If that intention is made good to the full it should bring a considerable improvement to the lot of the gas engineer and conduce to making his service a happier, more contented, and more effective one.

"Company men," on the whole, may not have much to complain of in the shape of interference on the part of unqualified outsiders. With very few exceptions indeed the company engineer and manager has been left to do his job in his own way so long as he retains the confidence of his Board. "Council men" have not, in very many cases, been so happy. They have had to submit, with some honourable exceptions, to the ill-informed criticism of elected persons. Elected assemblies are singularly ill-adapted to the management of business and technical undertakings. Not all have had the wisdom to leave the details of management entirely to the manager they have appointed. We are familiar with the spectacle of appointments of minor officials being decided by vote and even more technical matters still by this most fallible of methods. Frequent change in the personnel of committees is not conducive to continuity of policy. Many executive officers have seen their plans for development upset by votes motivated more by considerations of the next election than by the welfare and progress of the undertaking. Local government bodies have exhibited a tendency to keep down the scales of remuneration of their technical servants. They have been reluctant to recognize the market value of men possessing the qualifications and experience demanded in the management of an important public utility. If this has not led to inferiority in the technical quality of the "Council men" it is because professional pride has been sustained. There is another question deserving of consideration—the tendency to divide the Industry's technical personnel into the two categories, the "little works men" and the "big works men." There should be full open facilities for the former to graduate into the latter, for the all-round experience of the complete management of a comparatively small undertaking is at least as good training for the heavier responsibility of the big works as the restricted experience of the departmental manager.

The main point of our comment is that the opportunity should be seized to thrash out and put forward a proposal for the re-organization of the Industry's technicians on a country-wide basis instead of the somewhat parochial basis under which, to too large an extent, it now suffers.

NATIONALIZATION

LAST week the Minister of Fuel and Power opened a new Woodall-Duckham plant of continuous vertical retorts at Lincoln. The occasion, as a whole, was a red-letter day for the Lincoln Corporation Gas Department, for Mr. George Wright, the Engineer and Manager, and, indeed, for the citizens of Lincoln. We shall have more to say about the plant itself in a later issue; it is, from many points of view, a remarkably interesting installation—from the character of its architecture, the spaciousness of its construction, the complete modern control instruments incorporated, the excellent amenities for the operators, the prestige value for the Industry. But this short note is to emphasize Mr. Shinwell's remarks on nationalization of the Gas Industry at the opening ceremony reported in our issue to-day. That the Minister of Fuel has cognizance of the great service rendered by the Industry to-day and in past

years, and that he is certain that in the future these services will be called upon to a far greater degree, we have no doubt whatever. He was at pains at Lincoln to express his faith in the future greater importance in the economy of the nation of gas and the carbonizing industries in general; and he was at pains, too, to thank the Industry—which, while, generally speaking, finding it impossible to share his optimism regarding the successful operation of the nationalization principle—had offered its co-operation in the planning of "things to come." Nationalization will come, he pronounced once again. He added, however, that it will come not in weeks or months, but "in a few years." There is, then, to be further prolongation of the "interim period." During this period the Industry has much to do and much to think about, and it may find some consolation in Mr. Shinwell's assertion that the Gas Industry cannot be run by the Ministry of Fuel and Power; that it can be run only by those who know all about it.

Mr. Shinwell referred to the electricity industry, which, he said, is "different." "The municipal electricity authorities have promised to co-operate, but the private companies have promised stern and unrelenting opposition. It is intimidation. If co-operation is lacking, we must undertake the task ourselves—and that we shall do," we quote from his speech at Lincoln. On the same day Sir John Dalton addressed the North Western Fuel Luncheon Club on the subject of fuel technologists and nationalization, stressing that his talk was non-political and that it was not concerned with the rights or wrongs of the major policy of the present Government of nationalization. Assuming the fuel industries become nationalized, Sir John Dalton said it was clear that boards of directors and municipal gas and electricity bodies would disappear. In their place would be substituted regional boards and then a national board. He also thought that these boards would have their masters. There would be the Civil Servants of the Ministry to which the Industry is attached and then beyond the Civil Servants would be the Minister. So that the fuel technologists who to-day look towards a board of directors or municipal committee, will have four sets of bosses instead of the erstwhile one. He dealt with the claims of accountants and Civil Servants who would want places on these new nationalized boards and came to the conclusion that the fuel technologists would find that quite a lot of the seats were already booked. He stated "the orchestra stalls are filling up, or should we call it the dress circle?" We hope that as far as the Gas Industry is concerned Mr. Shinwell's assurance that the Industry can only be run by those who know all about it will hold.

MANTLE FAMINE

AN unprecedented shortage of mantles is causing grave concern among public lighting engineers and threatening a headache—in more senses than one—for those who continue to pin their faith to gas for lighting in their homes. Only for a few short weeks last autumn, between the final lifting of the blackout and the imposition of a dim-out that produced a depressing patchwork effect in all but the main roads, for the purpose of saving fuel, have we enjoyed full street illumination since 1939, and now it looks as if many miles of roads will revert to total darkness for lack of mantles. In gas-lit homes it is a question of converting to electricity or reverting to one or other of the more antiquated and less satisfactory means of lighting, for there are not enough mantles in the shops to meet the demand.

It is authoritatively stated that the sole reason why mantles are in such short supply is the lack of the requisite labour and raw materials, especially mantle rings. Most mantles—probably up to 95%—are made in the London area, where the scarcity of labour for all purposes is as bad as anywhere else in the country. From September, 1944, when the then Government was warned of the possibility of the present serious position developing, after a slight but temporary increase in the labour force available for mantle manufacture during the only time (August, 1945, to May, 1946) when the industry was scheduled under the Essential Work Orders, the labour position has steadily deteriorated. Most skilled workers were taken during the war for munitions, and untrained, elderly, part-time, and home workers had to be engaged. Because of this and the high percentage of absenteeism, output per girl hour is about 65% of what could have been expected on pre-war standards in spite of production bonuses and other encouragements.

Seven Government Departments are concerned, and all of them have been asked for help in getting labour. Approaches have been made to the National Institute for the Blind for suitable blind workers, and to the Prison Commissioners for prison labour, but so far without success. Some labour has been imported from Ireland and from a Development Area to assist in the manufacture of mantle rings, but this has had little effect on the supply position. A small factory outside London has been established to do some of the earlier bench operations in mantle production, and this is being extended. Apart from the starved home market there is a considerable overseas demand, but no mantles that could be made available for street and domestic lighting are now being exported, and no labour that could and would make such mantles is being used for export business. Gas undertakings, railway companies, and lighting authorities have first, and for the most part, the only call upon production. The possibility of importing mantle rings is being investigated, but for the rest of the present lighting season the position is not likely to be much easier than it is at the moment, unless and until labour and mantle rings can be provided.

Diary

Oct. 11.—National Federation of Gas Coke Associations: National Technical Committee, Gas Industry House, 10.30 a.m.

Oct. 11.—Solid Smokeless Fuels Federation Technical Committee, Gas Industry House, 2.30 p.m.

Oct. 11.—Chemical Engineering Group: "Chemical Engineering in the Tar Industry," R. Scott. Apartments of the Geological Society, Burlington House, 5.30 p.m.

Oct. 12.—Midland Junior Gas Association: Joint Meeting with the Western Junior Gas Association at Gloucester. "Reconditioning a Five-million Waterless Gas Holder at Base," D. M. W. White.

Oct. 16.—London and Southern District Junior Gas Association: Visit to the Wembley Research Laboratories of the General Electric Company.

Oct. 16.—Industrial Gas Development Committee, Adelphi Hotel, Liverpool, 10 a.m.

Oct. 17.—Solid Smokeless Fuels Federation: Executive Committee. 11.30 a.m., Dorchester Hotel, Park Lane, W.1.

Oct. 17.—Midland Association of Gas Engineers and Managers: Autumn General Meeting, King Edward House, Birmingham, 2.30 p.m.

Oct. 18.—Manchester District Association of Gas Engineers. Paper by H. Johnston, Bradford. Town Hall, Morecambe, 11 a.m.

Oct. 21.—London and Counties Coke Association: Finance Committee, 10.30 a.m.; Executive Committee, 11 a.m.; Central Committee, 12 noon; Annual Luncheon, 1 p.m. for 1.15 p.m.; Annual General Meeting, 2.45 p.m. Grosvenor House, Park Lane, W.1.

Oct. 22.—Southern Association of Gas Engineers and Managers (Eastern District): "The Application of the Lockheed Principle to the Automatic Operation of a C.W.G. Plant," J. C. Herbert. Gas Industry House, 2.30 p.m.

Oct. 24.—Midland Junior Gas Association: Visit to the Yorkshire Copper Works, Leeds.

Oct. 25.—North of England Gas Managers' Association: Autumn General Meeting, Sunderland. Visit to Hendon Works, 11.15 a.m.; President's Luncheon, Seaburn Hotel, 1 p.m.; Meeting, 2.30 p.m. Visit to Wear Glass Works, 3 p.m.

Oct. 29.—Southern Association of Gas Engineers and Managers: General Committee, 11 a.m. Luncheon, 12.30 p.m. Annual General Meeting and Presidential Address, Frank Dawson, 2 p.m. Grosvenor House, Park Lane, W.1.

At a British Restaurant

Mrs. John Strachey, wife of the Minister of Food, pays a visit to the gas-equipped St. Johns British Restaurant at the Isle of Dogs.

British Gas Council

The Executive Board of the British Gas Council for 1946-47 consists of the following 15 members representing the Districts shown:

R. J. Auckland (Cardiff), South Wales; T. Brown (London), London; Colonel W. Moncrieff Carr (Manchester), North Western; C. H. Chester (Swindon), Southern; E. Crowther (Newcastle), Northern; G. E. Currier* (Bradford), Yorkshire; Dr. E. V. Evans (London), London; D. Fulton* (Helensburgh), Scottish; Lieut.-Colonel J. Kennington (Grimsby), Eastern; A. W. Lee* (Birmingham), Midland; C. S. Shapley* (Leeds), Yorkshire; Colonel H. C. Smith (London), London; A. E. Sylvester (London) (Chairman), London; R. C. Taylor (Torquay), South Western; S. E. Whitehead (Southampton), Southern.

Those marked * represent municipal undertakings. In the ballot for 12 members the member undertakings were asked to vote for eight company and four municipal representatives. Mr. Sylvester was re-elected as Chairman, and Mr. Auckland and Lieut.-Col. Kennington were appointed after the ballot to represent those Districts which had not secured representation in the general voting.

A Broadcast Link-Up

In connexion with a B.B.C. broadcast from the Memorial Hall, City Hall, Sheffield, on Sept. 20, on the subject "The Crime Increase —How can it be checked?" the Sheffield and District Gas Company co-operated with the B.B.C. in distributing invitation cards to a representative cross-section of the public.

In the main entrance hall of the offices an attractive poster was displayed during the afternoon prior to the evening broadcast. A number of the staff of the Sheffield and District Gas Company were invited to attend, and it fell to the lot of Mr. Wm. R. Oliver, the Public Relations Officer of the Sheffield and District Gas Company, to be the first speaker in the discussion.

At the conclusion of the broadcast and during the discussion that followed, the Chairman of the Session mentioned the co-operation of the Sheffield and District Gas Company. This is just another example of how gas can link up with day to day topical events.

High Pressure Development

Keeping abreast of the times the Mid-Kent Gaslight & Coke Company are installing at their West Malling holder station three cylindrical high pressure gas storage vessels, with a total capacity of 100,000 cu.ft. The vessels will have a working pressure of 200 lb. per sq. in., and will supply a part of the extensive area of the Company through governors of Bryan Donkin manufacture.

This installation follows the completion of the high pressure holder of the Hortonsphere type which has a capacity of 75,000 cu.ft. and a working pressure of 60 lb. per sq. in. and recently erected for the Company at their Staplehurst gasholder station by Whessoe, Ltd.

In each instance where high pressure storage is being installed electrically driven compressors of Bryan Donkin manufacture are being standardized.

Under the management of Mr. W. A. Barnett, the Company continues to develop its high pressure gas supply system to several rural areas and various schemes of main laying are being carried out to meet the increasing business of the Company and the requirements of a number of new housing estates in various parts of the area.

Personal

The Directors of the Eastbourne Gas Company have appointed Mr. C. J. B. SAWBRIDGE, A.C.A., as Assistant General Manager as from Oct. 1, in addition to his appointment as Secretary.

* * *

Mr. FRANK CLIFFORD, for many years Manager of the Midland Office of Whittaker Ellis, Ltd., at Birmingham, has been appointed a Local Director to enable him to deal more effectively with the expansion of the Company's business in the Midland counties.

* * *

Mr. J. P. SMITH, of George Orme & Co., has been appointed General Manager of Sawer & Purves, Meter Manufacturers, Manchester. Mr. Smith served his apprenticeship with West's Gas Improvement Co., Ltd., and continued in their employ until 1930. Mr. J. Sides, Manager of Sawer & Purves, retired on Sept. 30 after over 41 years' service and was the recipient of presentations from the staff and employees.

* * *

Mr. H. G. RITCHIE, who retired last year from the position of Engineer and Manager of the Falkirk Gas Department, was presented with a silver cigarette casket by his colleagues from neighbouring undertakings at a small informal gathering at Falkirk on Sept. 26. The presentation, which was made by Mr. R. M. Simpson, Denny, was a token of esteem and grateful appreciation for the helpful services rendered by Mr. Ritchie during his term of office at Falkirk. Before going to Falkirk in 1920 Mr. Ritchie held appointments at Irvine, Fraserburgh and Kirkcaldy. Since his retirement he has taken up residence in Larbert.

* * *

After 54 years' service in the Gas Industry, Mr. HARRY C. HANDLEY, of Denton, has retired. He joined the staff of the Rochdale Corporation in 1892 and later became Assistant Manager. In 1914 he was appointed Engineer and Manager of the Whitworth Vale Gas Company, and in 1919 Engineer and Manager of the Denton Gas Department, which he held until the amalgamation of the works with Hyde and Dukinfield, and later with Broadbottom and Hollingworth undertakings, all of which formed the North Cheshire and District Gas Company. Mr. Handley was the recipient of a presentation made by Mr. J. Wilson, Engineer and General Manager, at a staff gathering at the Hyde showroom on Sept. 27.

Obituary

Mr. ANDREW THOMSON, Cashier to the Stirling Gas Light Company for over 30 years, died at Perth last week at the age of 79.

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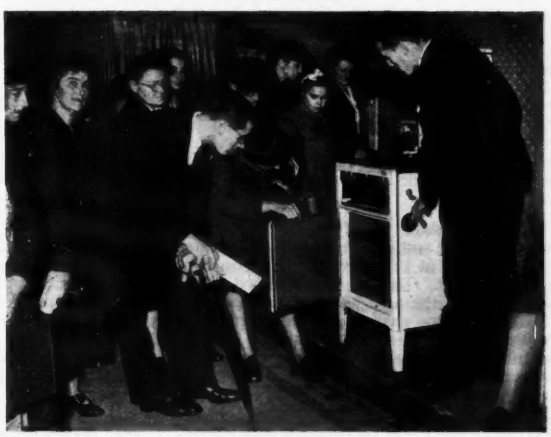
The death occurred on Sept. 30 of Mr. E. B. TULLY, Director of Tully, Sons & Company. Mr. Tully was chiefly concerned with the Company's business in Scotland.

Nice and Modern



Visitors at the "Britain Can Make It" Exhibition admiring the oven of the Radiation New World 548 Model Cooker.

News in Brief

The Price of Gas at Falkirk has been reduced from 3s. 9d. to 3s. 8d. per 1,000 cu.ft. for ordinary consumers, and from 3s. 11d. to 3s. 10d. per 1,000 cu.ft. for prepayment consumers. For industrial use, the price will be 3s. 4d. per 1,000 cu.ft., subject to discount up to 35%.

Gas Charges in the area covered by the Accrington District Gas and Water Board will advance if proposals put forward on Sept. 26 are approved by the Ministry of Fuel and Power. An increase of 1d. per therm (approximately 13% on existing charges) is recommended.

Ex-Service Employees of Edinburgh Gas Department were welcomed back by Treasurer A. H. A. Murray at a social function at Edinburgh on Sept. 25. Altogether 230 employees of the Department had joined the Forces. A special tribute was paid to Miss Alice Fitzsimmons for her work throughout the war on behalf of the Comforts Fund.

Subject to Ministry of Fuel and Power approval, the price of gas at Lancaster will be increased by about 4d. per 1,000 cu.ft., to apply probably next January. Alderman Bamber told the Town Council on Sept. 24 that the Lancaster carbonization installation had remained the only one of its type in the country. Instead of reconstructing the plant, the Gas Engineer proposed to erect an orthodox installation.

The British Aluminium Co., Ltd., announces that owing to the increase in the price of virgin aluminium and to further increases in production costs during recent months, prices for raw and fabricated aluminium products have had to be adjusted accordingly. With the new price structure for all standard products, users of aluminium are encouraged to order materials in the largest possible quantities to take full advantage of minimum prices and discounts.

Stockton-on-Tees Corporation is to spend £11,000 on supplying gas to the Portrack trading estate. The Corporation has been informed that by May next year the demand will be 10,000 cu.ft. per hour. The present gas main supplying the area, it was stated, was too small and a 12 in. main is to be laid. The scheme is being submitted for the approval of the Ministry of Fuel and Power and tenders are to be invited for supplying the pipes and carrying out the work.

Almost Half the Gas Street Lamps at Bury (Lancs) have been wilfully damaged during the past three months, and the Corporation has called in the aid of the police to combat a wave of lamp breaking which has resulted in 1,210 lanterns being smashed. The position is so serious that the Lighting Committee has decided to order the removal of lantern heads which are repeatedly broken and to place a notice on the lamp standards stating that " Owing to repeated wilful damage this lighting standard will be discontinued for a period."

Gas and Electricity Companies whose special Acts and Orders require them to hold meetings or balance their books more than once a year were, as a wartime measure, relieved from that obligation by the Gas and Electricity Companies (Relaxation of Obligations) Order, 1942. The Minister of Fuel and Power has now issued the Gas and Electricity Companies (Relaxation of Obligations) (Revocation) Order, 1946 (S.R. and O., No. 1504), in force as from Sept. 13. This Order revokes the Order of 1942, and accordingly the original statutory obligation is now again operative.

Many Industrial and Special Air-conditioning Contracts incorporating refrigeration were undertaken during 1945 by Matthew Hall & Co., Ltd., who also installed high pressure hot water heating, conversions to gas and oil firing, plants utilizing industrial waste products as fuel, process steam, gas, cooling water, compressed air, rough and fine vacuum services, ventilation, dust and fume extraction plants. In addition, the Company mass produced a large quantity of equipment for housing schemes. Speaking at the annual meeting on Sept. 30, Mr. B. Baden, the Chairman, announced that many infra-red black emitters had been installed for the rapid drying of paintwork and moisture extraction in rubber processing. Successful experiments had also been made in moisture extraction from pottery, furs, tobacco products, and other materials.

The Lanarkshire County Council Gas Undertaking (with plants at Cambuslang and Uddingston) staged an attractive show of industrial gas equipment at the " Lanarkshire Can Make It " Exhibition from Sept. 26 to 28. The exhibition aimed at showing industrialists the advantages of the area as a location for industrial and commercial activity. On the gas stand were examples of typical units suitable for use in the area—which has always been a highly developed one in the use of industrial gas. Included were a G.L.C. gas fired muffle furnace, a rivet heater, a Brayshaw metal melting crucible, a Ufix boiler, an Ellerstyle bakers' spray, a small incinerator, a Potterton infra-red paint dryer, and a number of Ascot units. The display attracted a great deal of attention and assisted to keep before manufacturers in this part of Scotland the many industrial uses which gas serves and which may not have been so continuously familiar as they ought to be, to many who saw them for the first time.

The Autumn General Meeting of the Midland Association of Gas Engineers and Managers will be held on Oct. 17, at 2.50 p.m., at the offices of the Midland Counties Coke Association, King Edward House, New Street, Birmingham. In addition to the general business there will be a sound film of " Pluto," illustrative of the manufacture and laying of the pipe line which supplied the Allied armies with petrol during the invasion of Europe, preceded by a sound film entitled " Through the Mill " showing the production of iron, steel, and tubes at the various works of Stewarts & Lloyds, Ltd.

Interior furnishing and equipment will be the keynote of the Modern Homes Exhibition which is being planned to open at the Dorland Hall, Regent Street, London, W., on March 25, 1947. The easing of many restrictions will make it possible to offer an even greater wealth of information and suggestion than in previous years. One of the special features of this Exhibition, sponsored by the *Daily Herald*, is a novel demonstration theatre in which household processes and equipment will be given an unusual presentation.

The Autumn Meeting of the Auxiliary Section of the North of England Gas Managers' Association was held at the Grand Hotel, Sunderland on Sept. 20, and the chair was occupied by Mr. J. R. Cleator, South Bank & Normanby Gas Company. A welcome was extended to the Section by Mr. C. C. Walmsley, Managing Director of the Sunderland Gas Company and the thanks of the members were expressed by the Chairman and seconded by Mr. R. Proud, of West Hartlepool. A Paper entitled " The Industrial Gas Engineer " was given by Mr. F. Dickinson, Industrial Gas Engineer to the Newcastle & Gateshead Gas Company, which was followed by a discussion in which several members took part. A vote of thanks to the Author was proposed by Mr. J. E. McManus, Willington Quay, and seconded by Mr. W. Morton, Darlington.

The Newport (Mon.) Gas Company has introduced a new departure in its Home Service in organizing evening demonstrations specially framed to give the maximum assistance in the present difficult times to brides to be and young brides. At the inaugural demonstration considerable numbers of those interested were cordially welcomed by Mr. A. H. Dyer, the Company's Assistant Engineer, while Miss Florence Davies' introductory talk covered the chief features of present-day cookery and the provision of well-balanced appetising meals notwithstanding the rationing of essential foods. These special demonstrations will continue at the gas showrooms on Monday evenings in the endeavour to show how to serve attractive meals even with the limited quantities of meat, fat, sugar, &c., now available the subjects to be dealt with covering the basic principles and foundation recipes for all types of cookery.

Our photograph is of the British Gas Council's Information Bureau at the Association of Public Lighting Engineers' Exhibition which was held at Central Hall, Westminster.

New Woodall-Duckham Plant Opened at Lincoln

Mr. Shinwell on Nationalization

Last Wednesday was a red-letter day in the annals of the Lincoln Corporation Gas Department, when a new 2-million cu.ft. installation of Woodall-Duckham continuous vertical retorts was opened by the Minister of Fuel and Power, Mr. Emanuel Shinwell, before a large gathering of gas engineers from all parts of the country and civic heads of Lincoln and the surrounding district. The plant is exceptional in the character of its architecture, the spaciousness of its construction, the complete modern control instruments incorporated, and the excellent amenities for the operators. A full illustrated description of the new plant will be given in next week's "JOURNAL." Mr. George Wright, the Engineer and Manager, is to be congratulated on a very fine achievement which signalizes future progress, and the citizens of Lincoln have good cause to be proud of their gas undertaking and the service it does and will provide.

Opening the new carbonizing plant at the Bracebridge Works, Mr. **Shinwell** admitted that he was confronted by serious troubles in the sphere of fuel supply, but added an assurance that with renewed efforts by the mineworkers and with the co-operation emerging between the National Coal Board, the mineworkers and managers, and perhaps with the advent of better weather, we should be able to get through. The country needed coal, and demanded it, and he was sure that in the end they would be able to satisfy the country's need. At the close of his speech, Mr. Shinwell said: "I have got a sticky job, but in spite of the difficulties I am sticking to that job until I find the solution."

Before opening the plant, Mr. Shinwell, accompanied by the Mayor of Lincoln, Alderman J. W. F. Hill, and members of the City Council, operated a weighing machine and registered the weight of a truckload of coal which had been delivered to the gas-works siding.

Mr. Shinwell opened with a word of praise for the Lincoln Gas Department, which, he said, had a record of achievement and had made phenomenal improvements, and he added that the opening of the new plant indicated even more remarkable progress in the future. The opinion that the Gas Industry in this country was a back number was without foundation. "Gas production and supply, and, in particular, carbonization and the important residuals that flow from carbonization have a great future," he said. "I do not disparage the electricity supply industry even if there are some people associated with that industry who seek to disparage me. In spite of the development and achievements of electricity there is, and will be for a long time to come—at least until the advent of atomic energy in its perfected form—a place for the Gas Industry. Instead of going back, the Industry is destined to become of even greater importance in the years to come."

Referring to the fuel supply position at Lincoln, Mr. Shinwell paid a tribute to the City Gas Engineer, Mr. George Wright, and said that his work had been recorded at the Ministry of Fuel. Regarding coal supplies, he continued: "I think you will be well supplied in Lincoln. Difficulties will appear—difficulties which are not necessarily associated with fuel, but with plant. That is a matter not within my control, nor within the control of my Ministry. It is attributable to one cause alone—namely, the war, and the demands made on plants during the war. We had to set much aside because victory was important. Every effort must be made to replenish plant to satisfy the needs of the consumers. Every effort will be made by my Ministry and kindred Ministries like the Ministry of Supply, to render every possible support to the Industry as far as plant is concerned."

Nationalization

Speaking of the proposed nationalization of the Gas Industry, Mr. Shinwell said that in a few years—perhaps not weeks or months—the Gas Industry of this country, both municipally and privately owned, would be transferred to the State and would become a unified and co-ordinated concern. It would be for the benefit of the nation at large, and there would be such compensation as might be regarded as necessary to console the existing owners. The Government would adopt the same process in regard to electricity. "But that is different," added Mr. Shinwell. "I expect no opposition from the municipal gas departments, but, generally speaking, the Gas Industry cannot find it possible to see my point of view. However, they have offered to co-operate if and when the Government takes over." The Industry could not be run by the Ministry of Fuel and Power, and the Ministry would need help and assistance. The Industry must be organized and administered by the people who knew all about it.

"With the electricity industry it is different," he continued. "The municipal electricity authorities have promised to co-operate, but the private companies have promised stern and unrelenting opposition. It is intimidation. If co-operation is lacking, we must undertake the task ourselves—and that we shall do."

The opening of the extension at Lincoln indicated increased production, but it was of more value than that, because increased production meant increased consumer capacity. "It means that people want more and more, and it signifies the progressive and rising standard of living. It is a valuable contribution to the prosperity of this country."

A Point of Honour

Col. **H. C. Smith**, General Manager and Chief Engineer of the Tottenham and District Gas Company, Vice-Chairman of the British Gas Council, who replied, said that he had never come across another Industry in which the people employed made it a point of honour to give their best to the consumers. The Gas Industry meant to the public an industry that supplied value and on which they had been able to depend implicitly, except on the few occasions when the supply had failed owing to circumstances beyond the control of those engaged in the Industry. It had been in business now for 130 years and had weathered many storms. The threats and wild attacks did not worry them very much—they knew they had the goods to sell and they were going to make and sell them. "But," continued Col. Smith, "we depend largely on the supply of properly prepared coal. The supply of coal to the Gas Industry has deteriorated since the coal legislation of the 1930's. In a free market we were able to buy the coal we wanted. Since we have lost that freedom the coal position has definitely deteriorated, and I beg of the Minister to explore the possibilities of having that task investigated."

Col. Smith went on to say that to-day the Gas Industry was threatened with nationalization a little more mildly than a few months ago. "The question of ownership of the Industry is not a vital one," he maintained. "The Industry has never been an industry for making large profits, and we feel that this question of a change of ownership is not the vital one, but what is vital is what re-organization is going to be applied to the Industry in the future, and we are anxious that no plans will be put into operation for the future control without the fullest investigation and consideration.

The opening ceremony at the gas-works was preceded by a luncheon at the Saracen's Head Hotel, at which members of the City Council, and representatives of the Gas Industry from many parts of the country were present; and following inspection of the works the toast of the City of Lincoln was proposed by Dr. **E. W. Smith**, C.B.E., reply being made by the Mayor, Alderman **J. W. F. Hill.**

Domestic Gas Appliances

The first part of B.S. 1250, Domestic Gas Appliances for Immediate Post-war Housing, dealt with classification, dimensions, and ratings for existing gas appliances, together with general requirements in regard to performance and was published in December, 1945.

The publication of Part 2 of this specification is now announced, and this is concerned with detailed requirements in regard to cookers, water heaters, gas fires, space heaters and refrigerators. The specification sets the standard for gas appliances for use in the immediate future, and this second part is of considerable importance, since it not only defines the minimum acceptable performances for each appliance, but includes requirements in respect of design, finish, size, classification and general construction. The methods for the performance tests for the various classes of appliances referred to in the specification are detailed in the Appendices.

Appendices A to F inclusive are general and common to all classes of gas appliance. Appendices A, B, C and D set down very clearly the general conditions under which the tests should be carried out, and the methods of examining governors, quality of finish, and the measurement of surface temperatures. Appendix E visualizes the appliances in operation under practical conditions and gives details of the measurement of the temperatures of adjacent walls, &c., and is thus of importance in eliminating fire hazard. Appendix F, which deals with combustion tests, refers to B.S. 717, Combustion Testing of Domestic Gas Appliances, which gives the methods in greater detail.

Appendix G deals specifically with tests of gas cookers and includes the methods of determining the efficiency of hot-plate burners, performance of grillers and oven cooking tests. B.S. 1115, Routine Testing of Domestic Gas Ovens, should be consulted when studying the requirements under Appendix G. Appendix H states the methods of test for both instantaneous and storage water heaters. Appendix J gives in considerable detail the methods of testing the radiant efficiencies of gas fires. Appendix K deals with the heating-up rates for radiant heaters. Appendix L states methods of tests for gas refrigerators of the air cooled type operating on a continuous cycle.

Copies of the specifications referred to may be obtained from the British Standards Institution, Publications Sales Department, 28, Victoria Street, London, S.W.1 (Telephone: Abbey 3333), price 2s. each post free.

Steam: Its Generation and Use in the Gas Industry*

By D. HICKS, M.Sc., F.R.I.C., A.M.I.Chem.E.
(Officer in Charge, Coal Survey Laboratory, Cardiff)

THE object is to describe the approach to efficiency surveys and to illustrate this by reference to the generation and use of steam in the Gas Industry. The principles involved are the same in every industry.

Managements frequently attribute poor fuel efficiency to a poor quality fuel and claim that if the quality of the fuel was improved then automatically efficiencies would improve. This is a fallacious argument and contrary to the experience of the South Wales Fuel Efficiency Committee which has frequently met an indifferent fuel economy when the best fuel was used and not infrequently have found good fuel economy when the quality of the fuel has been poor. The key word is efficiency and not fuel and the key to efficiency is measurement and supervision. In the absence of measurement and close supervision at every stage of manufacture there can be no assessment of existing efficiencies or any precise indication of the lines on which improvement can be effected. In brief, efficiency has been found to be a function of the quality of management.

The Final Aim

Measurement does not necessarily mean elaborate instrumentation, although, eventually, to attain the highest efficiency a continuous record of performance will be necessary in most works. The cost of instruments and the maintenance charges have proved to be a profitable investment. The final aim of all fuel efficiency surveys is to strike a detailed heat balance and apportion the losses so that possible economies can be estimated. In preliminary surveys the three simple instruments, the gas analyzer, the draught gauge and thermocouple, provide data on which actions can be based often resulting in big savings.

The main steam requirements at a gas-works can be listed under three headings, namely, that required for process work, that required for the operation of the gas making units, and that required for handling and transmitting materials. It will usually be found that the handling of coal and coke is preferably done by electrically driven machines. To what extent exhausters, boosters, pumps and fans should be electrically driven will depend on the availability of steam and usually this and load factor considerations will determine if either electricity or steam or both are made available for these purposes. Serious consideration should always be given to the relative economies of purchasing or generating electricity on site. This and other aspects of the use of steam in a medium sized works have recently been discussed by S. Ashworth, Resident Engineer, Leyland Gas Company, in a Paper "Some Considerations of Power Utilization on a Medium Sized Gas-works" read to the Manchester and District Junior Gas Association, February, 1946.

The Total Steam Requirements

The total steam requirements will depend on the factors listed above plus the layout, age and efficiency of the steam-using equipment. It is desirable at the beginning of any fuel economy campaign to know what are the normal steam requirements in an efficiently conducted works. This will give a measure of possible savings. The subject has been dealt with by many experienced gas engineers in various publications. Pexton (Fuel Requirements of Carbonizing Plant, "GAS JOURNAL," Jan-Feb., 1943) uses in his calculations 1,000 lb. of steam per ton of coal carbonized with an average of 1,450 lb. of steam per ton of coal during the period 7 a.m. to 5 p.m. and an average of 680 lb. per ton from 5 p.m. to 7 a.m. Birks (Gas-works Practice, Proc. Inst. Mech. Eng., Vol. 127, 1934) lists the steam and electrical requirements of six works and gives a consumption of steam ranging between 81 and 101 lb. for 1,000 cu.ft. of gas or approximately 1,200-1,900 lb. per ton of coal carbonized. Cook, describing the New Gas-works, Blackpool (Trans. Inst. Gas Engineers, Vol. 89, 1939-1940) bases his calculations on an average consumption of approximately 1,150 lb. steam per ton of coal carbonized with approximately 60% of it used for process work (recovery of benzol, concentrating ammonia liquor, steam retorts and steam for producers) and the remainder for generating electricity. Therefore as an approximation 1,200 lb. of steam per ton of coal carbonized can be considered as a safe working figure with the proviso that in many works less than this should be required if process work is limited and where the steaming of retorts is not practised. The question each gas-works manager must ask is, "How does the consumption at my works compare with this figure?"

The two ways of meeting the steam requirements are by means of waste heat boilers recovering the heat from the gases leaving the settings and from direct fired boilers burning coke or coke breeze. The amount of steam generated in waste heat boilers depends on the temperature of the waste gases and on the quantity of coke used in the producers. Various figures have been quoted for the amount of steam generated per lb. of producer coke depending on whether the settings are vertical or horizontal. Pexton assumes for vertical retorts a yield of approximately 4½ lb. steam per lb. of producer coke. Birks says 4.2 lb., and Cook uses in his calculations 3⅞ lb. of steam per lb. of producer coke. For most practical purposes it can be assumed that 4 lb. of steam per lb. of producer coal can be generated in waste heat boilers attached to vertical retorts and approximately 3 lb. per lb. of producer fuel in boilers taking the waste gases from horizontal retorts.

If the consumption of coke per ton of coal carbonized is 3 cwt. then the recovery of steam will be 1,344 lb. per ton of coal carbonized in verticals and 1,000 lb. in horizontals. It will thus be seen that waste heat boilers will almost meet the steam requirements, in fact, at night time more steam is generated than should be used. Probably the waste heat boiler cannot meet the day-time peak loads; therefore there will be the necessity for stand-by breeze fired boilers. The augmenting of the waste heat by means of producer gas will in many instances obviate the need for stand-by plant except in periods when the boiler is down for overhaul and inspection.

The designers and manufacturers of waste heat boilers produce and market an efficient machine. Provided the operator ensures no serious air infiltration and sees that fire tubes are clean then trouble free and efficient running is obtained. Careful attention should be given to water treatment to avoid scale and the boiler should be blown regularly to reduce the solids content and prevent priming.

Future developments in the design of retort settings with added attention to recuperation and insulation will reduce the producer coke consumption with consequent lowering of the quantity of steam available from waste heat boilers thus demanding further quantities to be raised in coke fired boilers.

Direct Fired Boilers

The raising of steam in coke breeze fired boilers either in the hand fired shell type or in the mechanically fired water tube boilers presents no great difficulties provided certain elementary rules are observed. There are a number of well known and efficient hand fired furnaces which successfully burn breeze with low maintenance costs and the manufacturers of chain grates have overcome the difficulties by ensuring the correct ignition of the fuel and apportioning the forced draught. Combustion rates of the order of 20 to 25 lb. per sq. ft. of grate area per hour are normally obtained. When determining boiler capacity and performance using breeze it must be remembered that it is unusual to evaporate more than 5 to 5½ lb. of water per lb. of fuel. To get these results due care and attention must be given to the maintenance of the plant on the lines indicated in the Ministry of Fuel and Power Bulletin, No. 38, "The Maintenance of Industrial Boiler Plant."

At many gas-works the forced draught is generally provided by steam jets. It is not always realized how expensive this can be and that considerable economies can usually be effected by fitting fan forced draught equipment. The major mistakes in operation are failure to maintain balanced draught over the fires and keeping too thick a fire bed. A thin fire is necessary if breeze is to be burned efficiently and the balancing of draught is merely a question of training the stokers to manipulate the dampers, the controls being conveniently situated on the firing floor.

Efficient Utilization

The efficient utilization of the steam is as necessary as efficient generation if the overall steam economy is to be good. Steam is required in the Gas Industry for many different purposes and, relatively speaking, no particular steam consuming unit uses a major proportion of the total. Therefore although each unit may waste only a small quantity of steam in the aggregate the waste may be considerable and be further aggravated by substantial transmission losses. Efficient transmission of the steam is most important and to obtain good results the mains should be short, well insulated and adequately fitted with traps. There should be no steam leakages but valves should be carefully positioned so that if leakages occur the lengths of mains in question can quickly be isolated so that repairs can be done without interfering with other steam-using equipment.

The maximum use should be made of exhaust steam for process work and for the preheating of feed water. Considerable waste can occur in using excess steam for steaming the retorts and it is therefore recommended that tests should be done periodically to ensure that large quantities of undecomposed steam are not allowed to pass through the system.

* Abstract of Paper presented to the Wales and Monmouthshire Association of Gas Engineers and Managers, Porthcawl, Sept. 26.

Economies can be obtained and smoother operation will result if attention is given to distributing the load more evenly through the 24 hours. Pumps, boosters, and exhausters have an economic speed and if operated above or below are wasteful. Attention to this will often be beneficial.

Finally, every stage of generation and utilization should be surveyed and this means measurement which is the only basis on which sound action can be taken to ensure a maximum economy. This technique applied to all aspects of gas manufacture will result in an increase in the average efficiency of the Industry.

DISCUSSION

Mr. **A. Pickard** (Llanelly) said he would like to supplement the Author's remarks with regard to the use of electrical plant on gas-works. When a start was made with the reconstruction of the plant at Llanelly in 1943 it was contemplated that they would have a plant of sufficient size to justify the use of a further waste heat boiler, and they saved a considerable amount of labour by utilizing electricity in places where they had not used it previously. In preliminary negotiations between medium sized gas undertakings and electricity undertakings for the supply of electricity there was one thing that must be watched very carefully, and that was that while their usage of electricity might show a saving, the lower power load factor might counteract any economy on the works. It was conceivable that a small gas undertaking might use a very small number of units and yet have to pay £20 or £30 as a minimum charge. With regard to plant conversions, it was just as difficult now as at any time during the war to get the materials necessary for making conversions quickly, and if anything could be done to assist them in that way it would be a great help. It had been generally acknowledged that the practice of augmenting the heat of the waste heat boiler to get additional steam was an extravagant process. It involved burning coke in the producer and using the waste heat boiler for a purpose for which it was never designed. The waste heat boiler was designed to use the heat from the waste gases, and therefore to burn additional fuel in the producers to get additional steam was a wrong principle, and was not a satisfactory process.

Mr. **Emrys West** (Aberdare) said that owing to the demand for high grade coke it appeared to him that every effort should be made not to burn such a valuable fuel in gas-works for steam raising or, for that matter, in gas producers for heating retorts. Boiler furnace modifications should be thoroughly explored with a view to the combustion of inferior fuels which in his experience could be obtained if a real effort was made to do so. It would be extremely interesting to obtain accurate figures of the actual amounts of saleable coke used on gas-works for steam raising. Where insufficient waste heat from retorts was available he suggested that the solution would be the introduction of a combination of waste heat and breeze boilers. In addition more use should be made of the large quantities of heat carried to atmosphere by exhaust steam. It was remarkable how little live steam was necessary for benzole recovery if ample suitable provision was made for dealing with available exhaust steam. The problem of steam raising in small works was usually far more costly than in the larger works, particularly where steam production was a fast time job and fires had to be banked up to maintain the necessary heat while other duties were performed. It appeared therefore that the management should make doubly certain that there was no undue loss or consumption between the boilers and the various points at which it was used. The question of lagging of steam pipes, vessels, and containers could not be given too much careful attention. With regard to the general heat balance of the process of gas making he had always worked on the principle that if the furnace wall, for example, was too hot to be touched by the hand, it paid to insulate or lag that section, as the case might be.

Mr. **E. K. Regan** (South Wales Fuel Efficiency Committee) urged that in the case of the smaller works the generation of electricity could most effectively be accomplished by the use of back-pressure engines.

Mr. **D. T. Phillips** (Mountain Ash) said one very important point for the smaller works was the control of the exhauster. He estimated that in his own case he had made a saving of 75% in exhauster steam consumption, and they all knew that a large amount of steam was used at that point. He could not understand people allowing exhausters to use a lot of steam.

Need for Proper Balance

Major **E. Ivor David** said Mr. Hicks had given them a most informative discourse and had "put it over" in a pleasant manner which they had all appreciated. He had probably over-simplified his subject, but that might have been deliberate because he did not want them to think that these problems were not capable of being solved quite easily. The whole point was to get a proper balance between high pressure and low pressure requirements, and having established that balance there was no reason why they should not get efficient generation of electricity. Certain pieces of apparatus were, of course, intermittent in operation, but in spite of what Mr. Pickard had said about load factor he believed that if they had sufficient diversity they could keep their minimum demand down to a reasonable level and keep above their minimum charge.

Mr. **D. W. Rees** (Pembroke) said the use of electricity on gas-works was a very important feature at the present time. They were at present running the whole of their works at Pembroke on waste heat. Having explored the possibility of obtaining a supply of electricity from outside they had decided that they could generate it more economically on the works. Mr. Hicks' reference to manually fired boilers was important. They would all like to see a higher efficiency from such boilers, but they had not the operatives available. If they could improve the education of their boiler men he thought they would have a better efficiency on the works.

Mr. **W. J. Thomas** (South Wales Fuel Efficiency Committee) referred to the importance of the use of instruments. In many cases managements had spent a certain amount of money on instruments, but unfortunately they were not in operation and there was a lack of information as to the performance of plant.

Mr. **W. Clark Jackson** (Neath) said his works would have been in a bad mess recently if they had depended entirely on the grid for their electricity supply. There had been a breakdown in the sub-station at Neath and for about 48 hours there was no supply available at any works in the district. So far as the Paper was concerned he knew they were in for a treat because he had worked with Mr. Hicks for a number of years in various matters connected with the Gas Industry. With regard to steam economy, he had an excellent opportunity in 1938, when putting down new plant, of overhauling the whole of the steam losses throughout the works, and his staff did a fine job of work. If one went into a gas-works and looked at the steam from the pumps and exhausters and other steam utilization plant one invariably saw a continuous blow. At the beginning of the war he bought a very good secondhand exhauster from a large works. On stripping it he found the condition of the slide valves and piston rings was deplorable—and yet it had been running in one of the best gas-works in England. They could waste a good deal of steam if their condensing temperatures were not kept well down. If their temperatures, particularly in the case of gas condensers, were running up to 75° and 80° and even higher they would find that their exhauster engine had to be run 20, 25, and 30% faster to get the volume of gas through, due to the additional heat. They should go round with eyes, ears, and nose keenly alert to waste on the works. Exhauster and condenser temperatures were often much too high, and on the other hand insufficient attention was paid to valves and piston rings.

The Author's Reply

Mr. **Hicks**, briefly replying to the discussion, agreed with Major David that in a lecture of this nature over-simplification of the problems was unavoidable. Local conditions in each works would demand slightly different treatment but, even so, the principles were the same. He stressed that he did not wish to give the impression that the purchasing of electricity was necessarily the best proposition in every medium-sized and small works. He agreed with Mr. Regan that electricity could be generated very cheaply by means of back pressure engines with the exhaust used for process work. The point he had made was that every gas-works engineer should carefully study the relative economics and uses of steam and electricity and determine if the purchasing of electricity was preferable to the generation of it on site.

It was not known what was the average consumption of steam per ton of coal carbonized in gas-works in the country as a whole, but the general experience of the Fuel Efficiency Committee was that savings equivalent to a total of probably 200,000 to 300,000 tons of coal per annum might be obtained if attention was given to improving the overall efficiency of steam generation and utilization at all gas-works.

Progress at Bolton

Bolton Gas Department is worth a million pounds and in a few years' time will be free of debt, said Alderman Glaister, Chairman of the Gas Committee, in his review at the annual inspection of the undertaking. The Department is now carbonizing 90,000 tons of coal a year, from which it is obtaining 1,500 million cu.ft. of gas, more than 40,000 tons of coke, 100,000 gall. of benzol, and 6,000 tons of tar; Alderman Glaister said the present shortage of coal made it incumbent upon everybody to use coal to its best possible advantage. The maintenance schedule had been delayed by the war, and some of the carbonizing benches had been in continuous operation for 24 hours a day for 2½ years. Extensions to plant had had to be set back, and yet over the past seven years the progressive increase in output was 50%, while the increase for the current year would be 14%. A new carburetted water gas plant was being installed which would increase production by 1½ million cu.ft. and would enable them to reset one bench of retorts next year. They hoped by 1948 to build another retort, and they would have to consider the complete rebuilding of the Lum Street works.

We have received from Alar, Ltd., a handsome folder containing a number of sheets of technical data dealing with aluminium casting alloys. Further sheets may be added to this file when they are issued. For particulars apply to Alar, Ltd., 35, New Broad Street, E.C.2.

Wartime Distribution Developments at Perth*

By NICOL BAIRD

Engineer and Manager, Perth

(Continued from p. 561)

DISTRICT VALVE SCHEME

In common with all other undertakings during the war years, consideration of the gas supply system for any area could hardly be given without reflection upon the possible effect of attack by air. At Perth it was consequently thought desirable that the low pressure distribution system should be subdivided into smaller areas, and for this purpose district valves were inserted.

The general opinion of gas engineers in regard to district valves will probably be unfavourable in that such valves seem to deteriorate comparatively rapidly for want of regular use or attention, and certainly are frequently found to be useless at the very time when most urgently required. In an endeavour to obviate this possible disadvantage, all district valves inserted were those of Messrs. Westwood & Wright's self-lubricating type, which appear from their design to be particularly suitable for work of this nature. As an added precaution, however, ¼ in. dia. grease pipes well protected with "Denso" have been brought conveniently to the surface, and a quarterly routine operation of the valves instituted.

Referring once again to Fig. 2, it will be seen that the city area is conveniently divided into three portions, by the river, and by the railway system. On closer study it was found that the central area lent itself to a further simple subdivision, while a small area adjacent to the gas-works itself could be conveniently isolated. In this way, by the insertion of 21 valves, it was possible to subdivide the area of low pressure supply into five distinct districts (Fig. 6), four of which are separately supplied by a direct connexion from the holder station. The fifth smaller area was arranged to be fed separately from the 20-in. dia. main from the works. The pressure in this latter main varies from 5 in. to 13 in. W.G., but excellent results have been obtained by supplying the gas through three low pressure service governors at widely separated points.

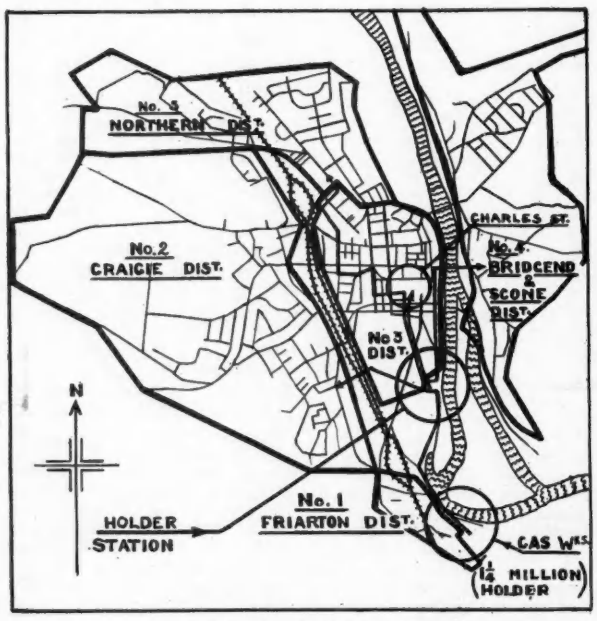


FIG. 6.—*Valved-off Districts*

The five areas in question have all been distinctively named—*viz.*, Bridgend District (including Scone) to the right of the river; the City and Northern Districts between the river and the main railway lines; Craigie District to the left or west of the railway system, while the fifth and smallest area, above mentioned, is known as the Friarton District.

When the valves were inserted, pressures were taken on both sides of each in a closed position, and compared with the pressures when the valves were opened. In this way, some light was thrown on the direction of flow of gas within the low pressure area. When the differences in pressure on either side of the closed valves were charted, it was actually found in one instance that gas was flowing rapidly up one side of a main thoroughfare merely to flow back again in an opposite direction on the other side. Since wherever there is a flow of gas there must be a head and pressure drop, it was obviously desirable to arrange the pressure supply to each of the Districts in such a manner, if possible, that whether the main valves were closed or shut, there would be no appreciable alteration in the pressures. By reducing the actual currents flowing in this way, the pipe network more properly becomes part of the storage system rather than merely an arrangement of supply pipe lines, while the consistency of supply pressure may be gauged by the reduction in the velocity of flow of gas taking place within the mains.

In this connexion an unusually interesting fault was fortuitously traced. The original site of the gas-works before the turn of this century was at Charles Street (Fig. 2), but owing to the very restricted area of the site, gas was sent to the two ½-million gasholders at the Shore Station via a 14-in. dia. main. This particular pipe was later superseded by the existing 20-in. dia. main to the city *from* the holder station in preparation for removal of the gas-works site to Friarton, when the 20-in. main between the new works and the holder station was laid.

In 1936, when it was found that the developing Northern District could not be adequately supplied through the 20-in. dia. feeder alone, it was decided to lay a 15-in. feeder directly to that district in the expectation of reinforcing the supply in the city area at the same time. When this was completed the results seemed to indicate that the desired effect had been achieved.

Instead of laying a 15-in. dia. main the whole of the distance from the holder station, a start was made at Charles Street by connecting to the original 14-in. dia. main, in order to save unnecessary additional expenditure, since it was known that this particular pipe, from all external appearances, was in an excellent state of preservation, in spite of the fact that it had been laid over 50 years previously, and had never been in use since 1900.

When the district valves were inserted and closed in 1944, however, it was found that the combined 14-in. and 15-in. dia. mains were inadequate to meet the demand in the furthermost extremities of a housing scheme development situated in the Northern District.

At first sight this seemed not merely disappointing but rather absurd, because it had already been fully anticipated that this additional 15-in. dia. pipe would adequately provide for all known further developments in the Northern District, far less the existing demand.

Recorders were duly connected in the various parts of this particular supply line in an endeavour to trace what was felt sure to be a partial blockage, but gradually it became clear that there was a substantial but fairly even pressure drop of more than 2 in. W.G. in the main feeder before reaching the consumers, and on still further investigation, this same pressure drop was gradually traced to be totally due to the unexpectedly high demand met by this feeder. Confirmation was later obtained from a reasonably accurate estimate of the amount of gas passing through all four of the governors approximating to the known total output from the works, and agreeing within acceptable limits with calculations.

If the district valves had not been inserted, this defect in the distribution system might never have been recognized, and the fact that the original 20-in. dia. feeder to the City was actually at peak loads supplying less gas than the new 15-in. main pipe could easily have led to subsequent misplaced expenditure.

This rather simple example demonstrates how one can be misled by a casual estimate of gas consumption in a particular area. On closer investigation it may actually be found that such an assumption is based on nothing more than intuition, and the need for reliable statistics makes itself only too obvious.

Appended herewith is the calculated amount of gas supplied to each of the four separately governed districts. An explanation of how this information can be derived is given later in the Paper. The salient feature is the comparative demand in each district when related to the size of corresponding trunk feeder mains. The total hourly delivery at the time of observation amounted to 180,000 cu.ft. from the works. 138,700 cu.ft. were accounted for in the four districts, leaving 41,300 cu.ft. to be allocated between the high pressure supply and the fifth isolated district of Friarton.

* Paper to the North British Association of Gas Managers, Rothesay, Sept. 12 1946.

It will of course be appreciated that throughout each day the relationship varies between the districts as regards consumption of gas.

CAPACITY TEST OF REGULATORS AT HOLDER STATION

MAXIMUM OUTPUT, MONDAY, FEBRUARY 28, 1944, 12.30 P.M.

	Districts			
	Bridgend	City	Craigie	Northern
Feeder main diameter ...	12 in.	20 in.	12 in.	14 in./15 in.
Valve opening	3/8 in.	5/8 in.	7/8 in.	5/8 in.
Inlet pressure (W.G.) ...	12.2 in.	12.2 in.	12.2 in.	12.2 in.
Outlet pressure (W.G.) ...	7.7 in.	5.9 in.	5.9 in.	7.0 in.
Differential pressure (W.G.)	4.5 in.	6.3 in.	6.3 in.	5.2 in.
Consumption (cu.ft./hr.) ...	24,000	41,600	29,500	43,600

Although the insertion of valves to subdivide the area would have been a satisfactory expedient for A.R.P. purposes, it is obvious that the 15-in. main is comparatively too heavily loaded to supply the Northern District by itself, and consequently to equalize pressures in the City and Northern Districts the valves have since been opened.

BRYAN-DONKIN TURBO BOOSTER AND DISTRICT REGULATORS

Following upon these considerations, it was decided that the problems of supply and demand could best be met, conveniently and economically, by the installation of a booster plant and district governors. The latter are normally situated in the districts of most distribution systems, but in this particular case it was possible to arrange four district governors to be housed in one building along with the booster plant. The effect has been to obtain a decentralization of the distribution system, with control from one point, and in this respect it is believed that the arrangement is perhaps unique.

A diagrammatic lay-out of the booster and regulators situated midway between the gas-works and the city is shown in Fig. 7. Gas may be supplied to the booster or regulators by a 20-in. main from the gas-works to the holder station or from either of the two ½-million holders adjacent to the building (Fig. 1). The gas is then distributed through the governors to the four districts previously described, and the regulators can be supplied with holder pressure or with somewhat higher pressure from the booster plant.

Automatic control is provided to start the plant when the inlet pressure to the governors falls below a predetermined amount, while an inlet pressure regulator prevents the booster from creating a vacuum, and in this way the holders are protected. A 24-in. loaded by-pass valve is fitted, and this allows the low pressure gas to flow forward to the regulators when the booster is out of action. This by-pass connexion was inserted under pressure, and a 24-in. valve was inserted in the original main which feeds the 24-in. manifold pipe to which is attached the four district regulators.

The complete arrangement of booster plant and governors has been installed in an existing building to which a small extension was added, and the total cost amounted to slightly more than £3,000.

The Rateau turbo booster has a maximum capacity of 200,000 cu.ft. per hr. at a speed of 2,550 r.p.m., giving at this maximum rating an outlet pressure of 12 in. W.G. when the inlet pressure is as low as 3 in. W.G.

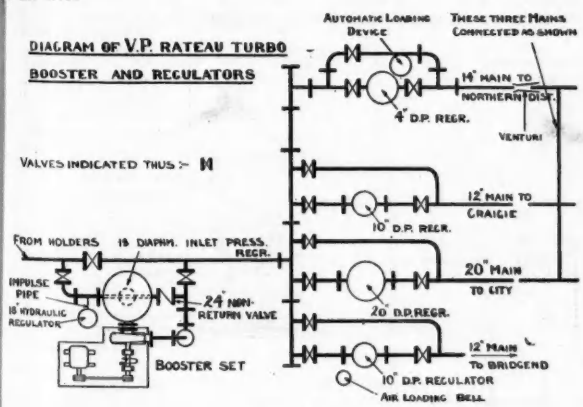


FIG. 7

The booster is driven by a 9 b.h.p. totally enclosed, compound wound, electric D.C. motor, attached to a power supply of 460 volts. The speed of the motor is 1,200 r.p.m., and the speed of the fan is stepped up to 2,550 r.p.m. by a multiple " V " rubber rope drive. The observed running cost in 1944 for electrical energy amounted to 0.06d. per 1,000 cu.ft. compressed with electricity at 1d. per B.O.T. unit.

It is interesting to reflect that a 1½ million cu.ft. gasholder throwing 12 in. pressure would cost at least £48,000, or £4,000 per inch of pressure thrown. Taking into consideration the reduced installation cost and maintenance charges between a gasholder and booster plant, it would appear manifest that such an installation would have a high economic value to any gas undertaking, particularly where low pressure storage is already available.

The unit is so arranged that a turbo booster of greater capacity can be substituted when required at a later date. Since the plant was put into operation a smaller ratio has been adopted for the multiple V-rope drive to reduce the fan speed to 1,800 r.p.m. and maximum outlet pressure to 16 in. W.G. with present peak loads, in order that gauge readings at off-peak loads will not exceed the capacity of the existing recording instruments.

As yet, no provision has been made to meet possible electrical breakdowns. The likelihood of a failure occurring, not only at times of peak gas loads, but also when the third gasholder happens to be less than half full, is regarded as somewhat remote at present. The

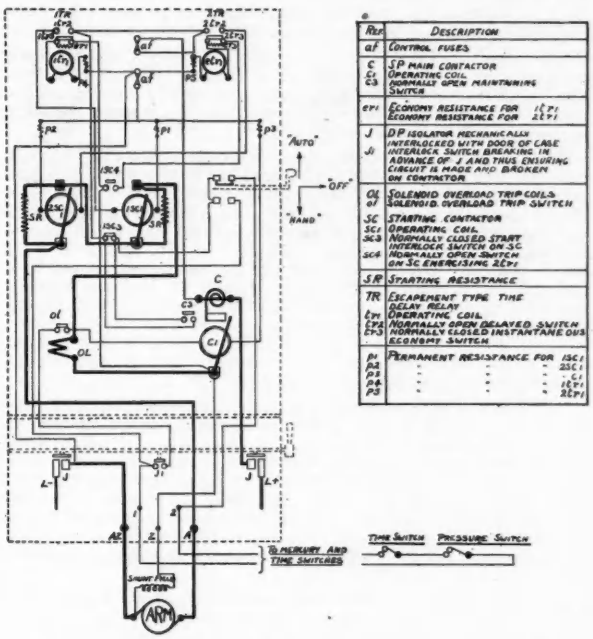

Ref. Description
af Control fuses
C, C1, C3 S.P. main contactor operating coil normally open maintaining switch
EP1 Economy resistance for 1 E.P.1
Economy resistance for 2 E.P.1
J, J1 D.P. isolator mechanically interlocked with door of case interlock switch breaking in advance of J and thus ensuring circuit is made and broken on contactor
OL, ol Solenoid overload trip coils. Solenoid overload trip switch
SC Starting contactor
SC1 Operating coil.
SC3 Normally closed start interlock switch on SC.
SC4 Normally open switch on SC energising 2EP1
S.R. Starting resistance
TR Escapement type time delay relay
tm Operating coil
EP2 Normally open delayed switch
EP3 Normally closed instantaneous economy switch
R1 Permanent resistance for 1SC1
R2 " " 2SC1
R3 " " C1
R4 " " 1EP1
R5 " " 2EP1
"AUTO"
"OFF"
"HAND"
TO MERCURY AND TIME SWITCHES
TIME SWITCH
PRESSURE SWITCH
SHUNT FIELD
ARM

FIG. 8.—*Wiring Diagram of Brookhirst Automatic Station*

time is no doubt already in sight, however, when additional precautions will require to be taken.

The plant is completely automatic, with the provision that automatic mechanism may be operated alternatively by a Venner time-switch, or a pressure-switch. The latter equipment can be pre-set to start up the booster plant whenever the inlet pressure to the plant falls below a predetermined level but so far reliance has been solely placed on the clock-controlled Venner time switch.

The controls actuate a Brookhirst automatic starter gear, the interconnexions of which are shown in the wiring diagram, Fig. 8. It will be noted in this connexion that the starting handle on this particular mechanism has three positions—namely, " auto," " off," and " hand control." Whenever the mercury pressure switch or the time switch is closed, the motor starts, and continues to run until stopped by either of these controls. When at the " hand " position the motor will, of course, start and continue to run irrespective of either of these switches.

The loaded by-pass valve which allows the low pressure gas to flow forward to the governors when the booster is out of action has the disadvantage that it absorbs about 1 in. W.G. pressure. This unfortunately also occurs at the very time when the maximum available holder pressure is required on the inlet to the regulators. The small pressure drop which is a feature of regulators fitted with an inspirator relay is consequently offset in this particular arrangement.

The starting period can be varied, as it is controlled by two escapement types of relays, 1 T.R. and 2 T.R. These relays close in sequence, and energize contactors 1 S.C. and 2 S.C., which cut out the starting resistance. The time can be varied to suit the conditions by adjustment to one or both relays, so that together a maximum starting time of 70 sec. and a minimum starting time of 30 sec. can be obtained. The normal setting is a starting time of 1 minute. The pressure

builds up very slighty until the 24 in. non-return valve closes, and then slightly quicker until the second relay comes into action, after which the pressure builds up further very evenly and steadily.

If an overload occurs the motor cannot be restarted until the switch contact shown on the wiring diagram has been reset by pressing a button on the left-hand side of the case. This provision against overloading is principally required when the booster plant is first started up on air. Owing to the difference in specific gravity of the air and gas, full load is reached with air at a much lower speed, and it is also for this reason that when starting up on air the outlet valves must be closed in order that the air may only be churned.

Composite chart (Fig. 3, Appendix I) shows the inlet and outlet pressures of the booster, over a 24 hr. period, and it will be seen that these vary very considerably, but additional charts from the outlets of City and Craigie District regulators demonstrate that these variations are completely eliminated. It will also be noted that the outlet pressure of the booster plant is, at certain periods, considerably in excess of the guaranteed outlet pressure of 12 in. W.G. This is due to two facts—*viz.* (1) the inlet pressure to the plant is still greater than was assumed for the design, and (2) the booster has not yet been required to work at its full capacity of 200,000 cu.ft. per hour.

The charts showing the outlet pressure of the Bridgend and Northern regulators are somewhat different from the rest. Instead of a constant outlet pressure of 6 in. W.G., different types of automatic mechanisms are fitted to these two regulators to step up the outlet pressures at times of higher demand.

All four governors are of the diaphragm type, having cast-iron pipe columns, and extended spindles between the bodies and diaphragm chambers, in order that the diaphragm chambers may be conveniently placed above the floor, while the valve bodies remain at the level of the underground pipes. Each governor is fitted with a 1-in. patent inspirator, a 1-in. low pressure regulator, two 1-in. Jenkins shut-off valves and 1-in. dia. M.I. inter-connecting piping, which was later replaced by chromium plated copper tubing to eliminate powdery rust choking the inspirators. This particular form of relay system enables the regulator to work with an inlet pressure only 1 in. W.G. in excess of the outlet pressure, and yet allows the advantages of the relay system, which ensures better control than can normally be obtained with a simple form of regulator.

Fig. 9 is a typical sectional drawing of a regulator, together with the arrangement of the relay system, while Fig. 10 shows a section of the auxiliary system including the L.P. inspirator. It will be seen that the main governor is fitted with double feed valves, mounted on a central spindle, and actuated by a main diaphragm, which is contained in the casing above the floor level. The main diaphragm chamber is isolated from the inside of the governor columns by means of a small middle diaphragm. The external appearance of the regulators, booster, and connexions, is shown in the accompanying photoplates Figs. 11a, 11b and 12a, 12b.

The functioning of the relay system may also be more clearly appreciated by considering two extreme positions:

1. If the outlet pressure is so low that the auxiliary governor lies fully opened, the gas feeding through the inspirator would tend to induce a very low pressure under the main diaphragm and thus open the main governor fully.
2. If, on the other hand, the outlet pressure is sufficient to close the auxiliary governor, the pressure under the main diaphragm would actually be the inlet pressue which would normally be ample to hold the main governor closed.

In general it is only necessary to weight the main governor to suit the minimum outlet pressure required, and by adjusting the spring loaded low pressure regulator a range of higher outlet pressures can be obtained, without further resetting the main governor.

Because of the fact that the City, Craigie and Northern Districts were inter-connected on the outlet side where the regulators were installed, special precautions were found necessary in setting the regulators to work. The Bridgend District is an isolated one, and did not present the same difficulties.

The only means of getting the other three regulators into service was by calibrating the main regulators and bringing them into action without any relay system at all. To carry this out, all the by-pass, inlet, and outlet valves, the low pressure Jenkins valves, and all the auxiliary governors were turned to the maximum open position, while the high pressure Jenkins valves were closed. The by-pass valves were then closed simultaneously, as it was desirable to maintain approximately the same outlet pressure on each of the three regulators.

The regulators were then left for about half an hour until a uniform pressure of 5½ in. W.G. throughout the three interlinked districts was obtained. The auxiliary governor was then released to the approximately correct position which had previously been determined and the high pressure Jenkins valves were then finally opened. The auxiliary governor immediately took control and each regulator was trimmed in turn. The outlet pressure on each of the three regulators was never disturbed more than $\frac{1}{10}$th of an inch during this procedure, and this ensured that one regulator was not allowed to pass more than its share of gas and so disturb the others. At a later date, when all the valves were inserted and the districts were known to be isolated, it was found that the setting of the governors obtained in this way was entirely satisfactory and no alterations were required in this respect, although for other reasons some modifications were made in the setting of the relay system, in order to obtain a slightly higher outlet pressure on one district compared with the other two.

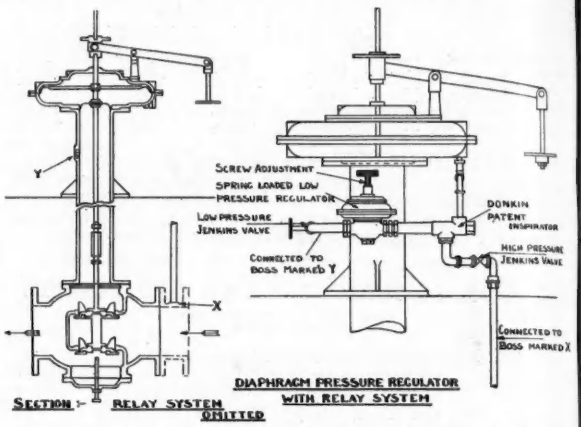
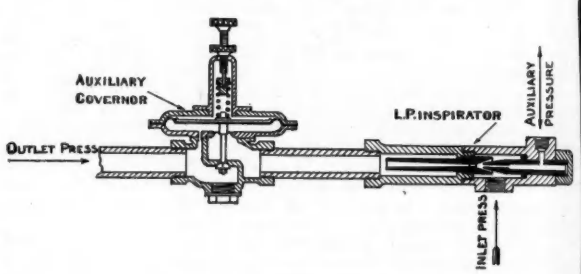


FIG. 9.—*Section of a Regulator with External View Showing Pressure Relay System*



SECTION OF AUXILIARY SYSTEM

FIG. 10.

(a) Clock Loading Device

It has already been mentioned that an automatic mechanism is used to increase the outlet pressure of the Bridgend governor during certain hours. This arrangement is shown in Figs. 13 and 14. The main regulator is set as previously described with an outlet pressure of 5½ in. or 6 in. W.G., while the air loading bell is connected to the

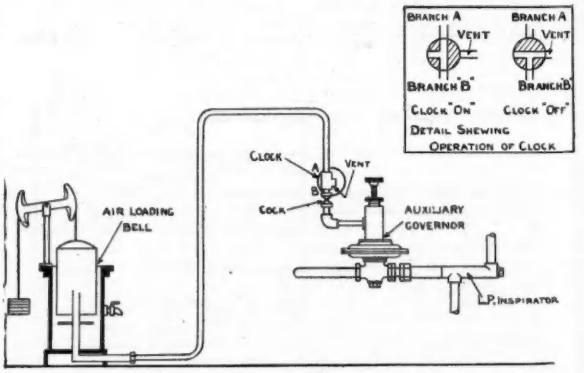


FIG. 13.—*Diagrammatic Arrangement of Air Loading Device*

atmospheric vent of the small relay governor through a "London" lamp controller, modified to meet the special conditions.

Fig. 15 illustrates the type of controller in question. The apparatus consists of a clock and gas tap mechanism. The gas tap is rotated

when the inlet pressure is about 12/14 in. W.G., and the consumption of gas is comparatively small. This inlet pressure to the regulators at the holder station could, if necessary, be readily controlled by the station governor at the works.

On the Bridgend governor chart it will be noted that the pressure is reduced in two stages. This effect is obtained by having the timing on the air loading device delayed approximately 20 minutes later than the time switch controlling the automatic booster, although in the example shown both clocks are synchronized when the booster is started up. This effect can be varied as required.

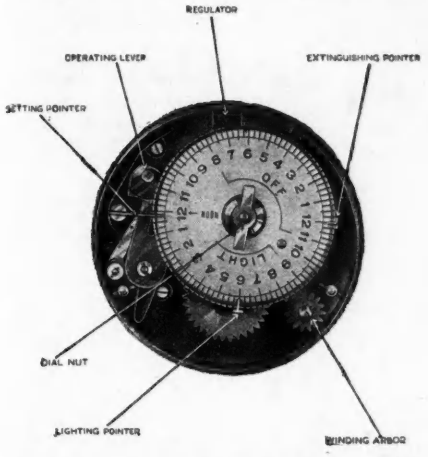


FIG. 15.—*Key to Operating Parts of the "London" Lamp Controller*

It will also be noted that when the booster is on, there is a slight diminution in the outlet pressure of the City governor. This depression was very much greater when the governors were originally installed, and before certain minor adjustments had been effected. The cause is merely the fact that there is an unbalanced area between the diaphragms and valves of the spring loaded low pressure relay governors. The improvement was effected on reducing the diaphragm area by inserting a small distance piece, so that the diaphragm was moved slightly up the central spindle. By careful adjustment it is possible to equalize the areas so accurately that the effect of the booster going on is not at all noticeable on the outlet pressures of the regulators. By proceeding further, as shown on the Craigie chart, a slightly increased pressure can be obtained instead of a reduction.

(c) Inlet Pressure Regulator

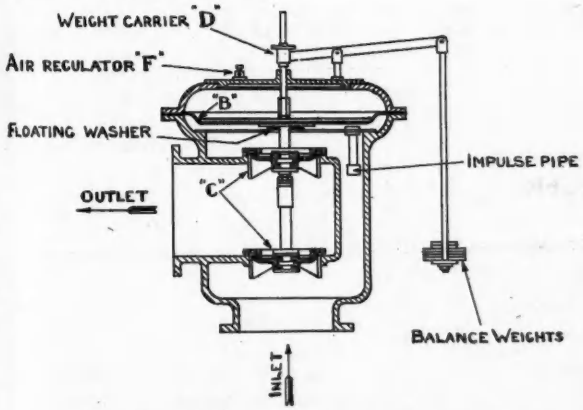


FIG. 16.—*Sectional Drawing of Inlet Regulator*

This mechanism, which is fitted to prevent over-drawing on the inlet main, is designed to close if the pressure falls below a predetermined level. The regulator, illustrated in Figs. 16 and 18, fitted with double-feed valves C mounted on a central spindle, is actuated by the leather diaphragm B, which is in communication with the inlet gas pressure. When the pressure in the inlet main falls below that for which the diaphragm is loaded the valves will fall and close, thus throttling the quantity of gas going forward. If the pressure falls to an extremely low figure according to the setting, the valves will shut altogether.

Adding weights on carrier D increases the gas pressure at which the regulator closes, and *vice versa*. The operating pressure can also be further reduced by adding weights on the balance arm E.

The method of setting the regulator is as follows: First of all, with the by-pass open and booster in operation, the various sizes of weights which were required to produce various pressures were found by trial on the site, and listed as follows:

Working pressure without any weights determined by partially closing inlet valve	4.3 in. W.G.
1 8-in. dia. × $1\frac{1}{8}$-in. lead weight on balance carrier reduces the pressure	6/10ths in. W.G.
1 $8\frac{3}{8}$-in. × $\frac{1}{16}$-in. lead weight on the balance carrier reduces the pressure	2/10ths in. W.G.
1 $8\frac{3}{8}$-in. × $\frac{6}{16}$-in. lead weight on main carrier increases the pressure	3/10ths in. W.G.
1 10-in. × $\frac{7}{8}$-in. lead weight on main carrier increases the pressure	1 in. W.G.

In order to set the inlet regulator approximately to 4 in. W.G. it will be noted that the pressure without weights = 4.3 in. W.G., and this has therefore to be reduced by about 3/10ths W.G. It is therefore necessary to add 1 $8\frac{3}{8}$-in. dia. × $\frac{6}{16}$-in. weight on the main carrier and 1 8-in. dia. × $1\frac{1}{8}$-in. weight on the balancer carrier—*i.e.*,

$$4\tfrac{3}{10} + \tfrac{2}{10} - \tfrac{6}{10} = 3\tfrac{9}{10} \text{ in. W.G.}$$

(d) Automatic Starting by Pressure

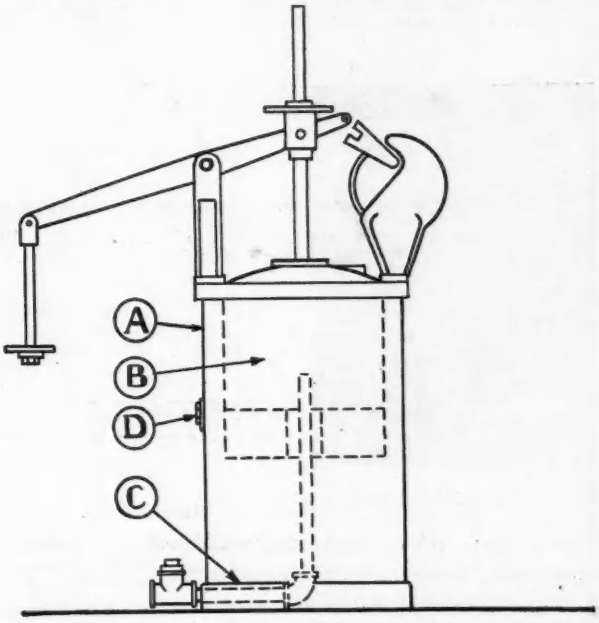


FIG. 17.—*Diagrammatic Drawing of Hydraulic Regulator with Mercury Cut-off Switch*

The hydraulic regulator with mercury cut-off switch, shown diagrammatically in Fig. 17 and pictorially in Fig. 18, can be arranged to start up the plant when the pressure in the inlet main to the booster falls to a predetermined figure, and to stop the booster when the pressure is restored.

The regulator consists of a tank A in which a bell B floats in a water seal. This bell is connected to the underside of the inlet pressure regulator. If the pressure at this point falls below the set figure the bell falls and brings the switch into the "on" position. The switch is wired in the no-volt release circuit, and when the circuit is broken the plant automatically starts. When the inlet pressure rises above the set figure the bell rises and the mercury switch cuts out the electric motor, thus stopping the booster.

The method of putting the regulator into action is to remove the plug D and fill the tank with water, holding the bell in its bottom position until the water level reaches the plug hole. The plug is then replaced and the pipe C, which is connected to the inlet main, transmits the impulse to the underside of the bell. Weights are then added to the hydraulic regulator to give the desired setting.

(*To be continued*)